

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Mitigation of Orbital Debris)	IB Docket No. 18-313
in the New Space Age)	
)	

COMMENTS OF SPACEFLIGHT, INC.

Spaceflight, Inc. ("Spaceflight") submits these comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding. While the NPRM raises many important questions, the focus of Spaceflight's comments is on questions raised relative to multiple satellite deployments based upon its experience in this growing and important market. As to these matters, Spaceflight urges the Commission:

(i) To take into account not just the risks, but the benefits of multi-satellite deployment and the ways in which those benefits may be preserved and the risks both understood and bounded;

(ii) Not to impose new and burdensome indemnification and insurance requirements; and

(iii) To harmonize Commission requirements regarding the mitigation of orbital debris with those of other federal departments and agencies and, as possible, with foreign administrations.

I. Spaceflight's Experience in the Field of Multi-Satellite Deployments

Spaceflight is a launch broker and integration services provider, providing access to space utilizing a rideshare model, aggregating spacecraft of varied size going to the same orbit. In this role, Spaceflight has provided integration services for multiple launches and over 200 satellites. While many of these deployments have occurred with the deployment devices remaining attached to the launch vehicles, more recently Spaceflight has developed free flying deployment devices that are themselves released from the launch vehicle before then deploying multiple satellites. Using a free flying deployment device is beneficial to rideshare missions; for example, a free flyer provides more separation signals than the launch vehicle can/would provide, enabling safe, timed deployment for multiple spacecraft.

This free flying deployment program was inaugurated in December, 2018, when Spaceflight launched its SSO-A mission (sun-synchronous orbit A) with a two free flyer deployment launched by a Space Exploration Technologies Corporation ("SpaceX") Falcon 9. The two free flyers deployed a total of 63 spacecraft from various entities, including 15 microsats and 48 cubesats from both commercial and governmental entities, of which more than 25 were from international organizations from 17 countries.

A major focus of Spaceflight's engineering program for this (and all of its missions) is to ensure safe deployment and avoidance of recontact events. This is, of course, not only an important concern for the Commission and other government agencies but also for Spaceflight and its customers. As part of this process, Spaceflight

used a six degree of freedom orbital trajectory analysis tool to measure the relative distance between every customer spacecraft and its two free flying deployers. This tool enabled Spaceflight to model the probability of recontact between the customer spacecraft during the mission in order to quantify the recontact risk and allowed Spaceflight to reduce the recontact risk by optimizing the mission deployment sequence. The analysis was modeled following the course of two orbits subsequent to the last customer spacecraft separation. During this initial two-orbit period, customer spacecraft were not permitted to engage in any maneuvers, propulsive or otherwise. Shortly after this time period, customers were allowed maneuver their spacecraft

For the SSO-A mission, Spaceflight's two free flyers deployed 63 spacecraft over the course of several hours. Spaceflight worked in conjunction with the Combined Space Operations Center (CSpOC) and in close communication with its spacecraft customers to coordinate initial spacecraft operations. None of the deployed spacecraft experienced a recontact event. By utilizing timed deployments and analyzing risk of collision based on most likely deployment and performance scenarios, Spaceflight was able to deploy a large number of spacecraft safely and effectively.

II. Benefits and Risks of Multi-Satellite Deployments

Deployment devices such as the free flyers utilized on SSO-A enable small spacecraft providers access to space and allow safe, reliable deployment of multiple spacecraft in a controlled manner. Far from creating a more hazardous space environment, allowing such spacecraft to be placed into orbit using well-established

launch services and well-designed and planned deployment missions, such as SSO-A, contributes to a safe space environment. As an alternative; 63 separate uncoordinated missions without the kind of engineering analysis and support provided by Spaceflight, could cause a real potential re-contact hazard.

As described above, Spaceflight performs probability analyses to limit recontact risks, and believes that it is reasonable to require other multiple deployer providers to perform similar analyses. In taking steps to avoid spacecraft re-contact, Spaceflight urges the Commission to consider several factors:

First, any collision analysis that is required of the deployment service provider (other than as to its own deployment vehicles) should be limited to an initial phase of deployment. In the case of the SSO-A, Spaceflight calculated this period as two orbit revolutions, during which the deployed spacecraft would be dispersing from their initial close proximity and recontact risk can be better avoided by requiring individual spacecraft operators not to engage their own propulsion or other maneuver devices. Once that initial period has passed, control of the deployed spacecraft is in the hands of each operator

Second, while it would be reasonable to require a party seeking a spacecraft authorization to disclose its plans for the deployment of its spacecraft and general information as to the steps that the provider will take to avoid the recontact of spacecraft during the initial phase of deployment, it would not be workable to require that detailed showings or calculations of such recontact risk be provided for the entire

mission of which a single spacecraft is a part.¹ Practically, such calculations would require information about a deployment manifest and particulars about other customer spacecraft that would not be available to individual deployment customers and that would be very much a moving target until relatively close to the launch date.

Third, when considering any risk that may be posed by recontact between multiple deployments, Spaceflight notes that a recontact event is different from a collision. In analyzing Spaceflight's SSO-A mission risk of spacecraft recontact for example, Spaceflight considered both the probability of recontact as well as the potential consequence of any recontact. On the few occasions in which a hypothetical recontact event was identified during Spaceflight's analyses, the closing velocity between the objects was 1.8 meters per second or less, which is equivalent to dropping an object from 0.17 meters (6.7 inches) off the ground. Contact at this very low speed would cause little or no debris. The recontact instances identified in Spaceflight's analyses are far different from an orbital collision; most orbital collisions are measured at extremely high velocities (over 3,500 meters per second). Sub-one-meter per second contacts are not considered debris generating events. Therefore, the combination of low probability of recontact and negligible consequences of the low-velocity recontact to the general space environment result in an overall low mission risk of spacecraft recontact.

¹ Compare NPRM at ¶¶ 21, 40-41.

Fourth, while free-flying deployment devices are themselves objects in space and therefore have some theoretical potential of risk to create orbital debris,² that risk is little different from that posed by a later stage of a launch vehicle and can be accounted for under a normal orbital debris risk assessment analysis.

III. Liability Issues and Economic Incentives.

Spaceflight believes the current U.S. Government regulatory environment adequately protects against potential third party liability issues. Space station operators already devote a significant amount of resources to obtain necessary licenses. Among other things, the Federal Aviation Administration launch licensing requirements dictate that for each licensed or permitted activity, parties who are directly or indirectly involved with the permitted activities (*e.g.*, launch) enter into a reciprocal waiver of claims and the waiver includes indemnification of the United States Government. Adding new FCC indemnification and insurance requirements on top of the requirements already in place³ could create a chilling effect on the U.S. space market, adding cost and burden on the industry and potentially driving companies to seek licenses in other jurisdictions and/or giving those companies that operate under foreign licensing regimes a competitive edge over U.S. licensed companies.

² See NPRM at ¶ 21

³ See 14 C.F.R. § 440.17.

IV. U.S. and International Jurisdictional Issues

The nature of Spaceflight's multiple deployment missions requires it to navigate among many U.S. and foreign licensing and regulatory entities. Spaceflight accepts this responsibility willingly. At the same time, Spaceflight asks the Commission's help as it considers fashioning new rules in this area, to do so in coordination with other U.S. departments and agencies that are involved in the assessment of the risk of orbital debris to ensure that the departments and agencies establish consistent rules and policies and among themselves with clear lines of demarcation as to which department or agency may be responsible for authorizing particular missions.

For example, the NASA orbital debris mitigation standards are well known within the industry. If the Commission believes that those standards require updating⁴ we respectfully encourage the Commission to work with NASA and other federal agencies involved in the subject to arrive at a single standard that would apply across all regulatory entities.

Similarly, on the international front, Spaceflight asks the Commission together with other U.S. federal departments and agencies to work with their foreign counterparts on a single set of standards for the mitigation of orbital debris that will apply regardless of which state's licensing administration will govern. Multiple standards burden operators with investing additional resources and incurring costs in assuring compliance with different requirements. Worse, as noted above, they can lead

⁴ Compare NPRM at ¶ 59.

operators to seek out licensing under regimes that impose less rigorous standards. Such a result could have the direct opposite effect of the Commission's goal of a safer orbital environment.

Respectfully submitted,

SPACEFLIGHT, INC.

/s/

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